EARTHQUAKES & VOLCANOES

AND OTHER NATURAL PHENOMENA

EARTHQUAKES & VOLCANOES

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This edition first published 2004

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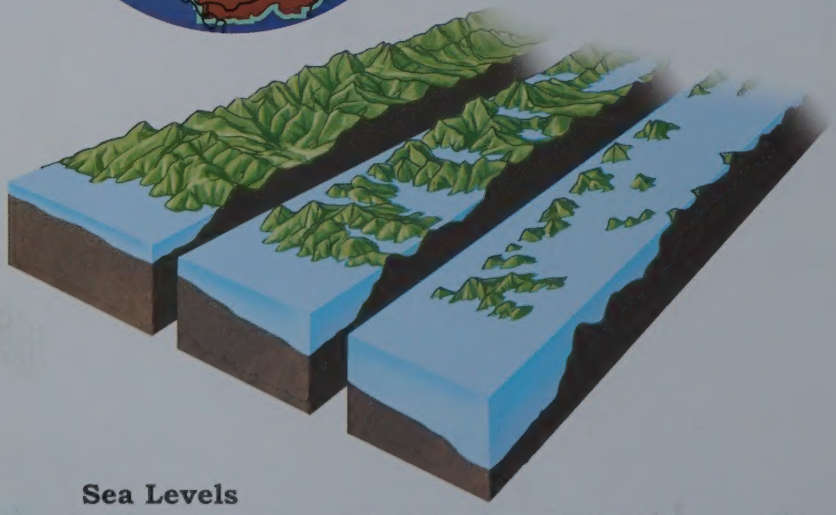
WHEN DINOSAURS RULED

Weather conditions, earthquakes, ocean tides, floods, landslides... all these are natural phenomena (things which happen) and over the centuries they have all contributed to the development of the landscape. Some phenomena, such as the eruption of a volcano, have immediate and very violent consequences. Others, like variations in sea levels or the separation of the continents, are less dramatic, because these take place over a very long period of time and affect almost the whole of the Earth. Such changes in the environment can also cause the extinction of some species of animals which are unable to adapt to new conditions.

Continental Drift

This is the name given to the separation of the continents and which has happened due to the thrust of the magma below the Earth's surface. As well as the Continental Drift, this thrust has also brought about great geographical changes, such as the expansion of the oceans and the formation of mountain chains. It is also the reason why the surface of the Earth continues to move, and certain areas of the globe become hotter or colder. Such changes in the climate are one reason why some species of animals and plants have become extinct, to the advantage of those species which are more resistant to climatic variations.



Sea Levels

The rising of sea levels is generally due to an increase in global temperature which melts ice or moves it down towards the coast. But if the coastline expands because of sediment transported by river waters, the level of the sea lowers. In both cases, the variation of the surroundings can make some species of fish, molluscs or crustaceans, which live at particular depths, disappear.

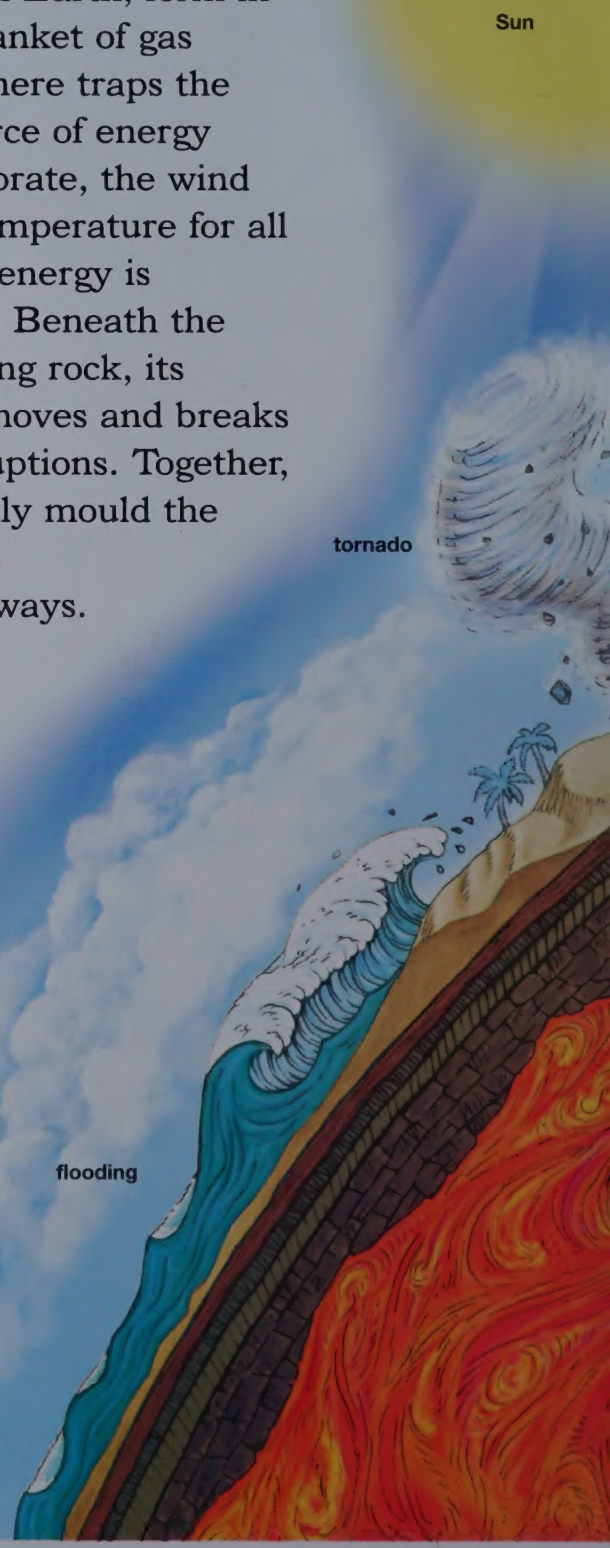
meteori

Dinosaurs

Dinosaurs were reptiles of the past. They became extinct quite suddenly, about 65 million years ago. Their disappearance is still a mystery. The most popular theory is that a vast cloud of dust rose up after the fall of one or more enormous meteorites. This blocked out the Sun and caused great changes in the climate. The dinosaurs could not survive these changes.

GREAT FORCES AT WORK

Clouds, rain, sunshine, wind – the main natural phenomena which regulate the climate on Earth, form in the atmosphere, the thin and precious blanket of gas which surrounds our planet. The atmosphere traps the heat from the Sun. This is our great source of energy which makes the waters of the seas evaporate, the wind move and keeps the Earth at the right temperature for all living things. Another powerful source of energy is contained within the depths of the Earth. Beneath the Earth's crust, a sphere of fused and shining rock, its magma, is constantly moving. Its force moves and breaks up the continents and causes volcanic eruptions. Together, the Sun and the magma slowly and silently mould the Earth. But sometimes the magma breaks out with violent force and in spectacular ways.



Atmosphere
This is the blanket of gases, including hydrogen, oxygen and water vapour which surrounds the Earth, within the first 40 kilometres above our planet. It is kept around the Earth by the force of its gravity.

Earth's Crust
This is the external solid layer of the Earth, formed by the rocks of the continents and the depths of the seas. It is thickest beneath the continents and thinnest underneath the oceans.

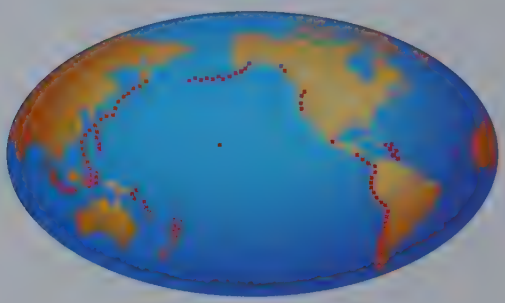
Mantle
This is the intermediate layer of the Earth, mostly liquid and glutinous, made of magma. The Earth's crust 'floats' on this.

Nucleus
This is the most internal part of the Earth. It is a solid ball, probably made of metals, such as iron or nickel. It has a very high temperature of between 3000°C and 4000°C.


atmosphere
clouds
landslide
volcano
Earth's crust
magma
mantle
nucleus

WHEN THE EARTH EXPLODES

The glowing magma of Earth's mantle pushes up towards the surface, searching for ways to escape through cracks in the Earth's crust. It does not always get through. If the crust is too dense, the magma stops and flows back, until, with the gases of the magma, it stays trapped. In time it succeeds in escaping – then, it explodes like a cork from a bottle. A volcano is 'born'. This erupts magma into the air in the form of molten lava, gas, ash and solid fragments. In time, the lava will form the point of a volcano.



Most volcanoes are found along the cracks in the Earth's crust. Over half the world's volcanoes are in the area which encircles the Pacific Ocean, the so-called 'ring of fire'.

Pompeii and Herculeum – 79 AD

On the 24th August 79 AD, the eruption of the volcano Vesuvius destroyed the twin cities of Pompeii and Herculeum. Both were buried entirely under metres of ash, lava and mud. All this preserved Pompeii almost intact for centuries, enabling people today to see evidence of the lives of the ancient Romans.

Lava

This is the molten rock (magma) which erupts out of a volcano. Some types of lava are very liquid and flow for long distances. Then, as the lava cools, it forms thick ridges or hexagonal columns.

Lapilli

These are fragments of lava which are thrown into the air from the volcanic eruption. The smallest fragments form ash. Some larger fragments become moulded as they fly through the air, and these are called lava bombs.

Hawaiian Volcano

This volcano is typical of the Hawaiian islands. It has a flat shape, like a shield. In the Hawaiian zones, volcanic lava is very liquid and flows slowly from the central mouth, sometimes forming lakes of lava at the base of the crater. This type of eruption is called effusive and causes little damage.

THE DANGERS OF VOLCANOES

Lava is not the only danger of volcanic eruption – nor the most serious. Lava flows slowly, giving people time to flee from danger. It is more difficult to escape the enormous clouds of ash. The ash covers everything very rapidly, over great distances, and when it lands on the ground, it suffocates all forms of life. Volcanologists (people who study volcanoes) are always trying to prevent this danger by observing all the phenomena which happen in the vicinity of a volcano. Tremors and seepages of gas in particular can be signs of an eruption about to happen, but nobody can predict exactly when, or how violent this will be.

How lava flows

Lava flows in a bed which is closed in by banks. To prevent lava spreading to areas where people live and work, ways have to be found to divert its course. A new path can be opened by letting off explosive charges in one of the banks. Alternatively, lava can be bombarded from an aeroplane, so that it flows out of its bed to form 'lakes' and so stops flowing.

Burning cloud

A burning cloud glows with the effect of ash, powder gas which often overflows from the volcano and rolls rapidly down towards the base. If this mixture combi with the water of a lake or with rain, it forms a dangerous flow of mud called lahar, which buries and suffocates everything.

volcano

ash

Mofette

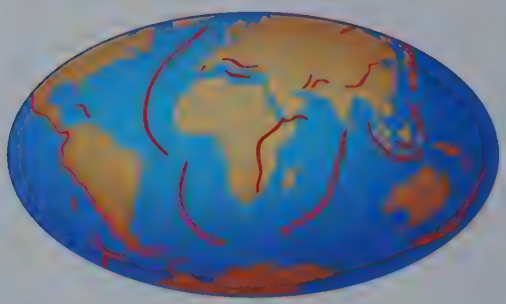
This is an escape of carbon dioxide through thin splits of earth in the zones near the volcanoes. This very dangerous gas is heavier than air and so remains near to the ground, suffocating everything underneath it.

Fireweed (Rosebay Willowherb)

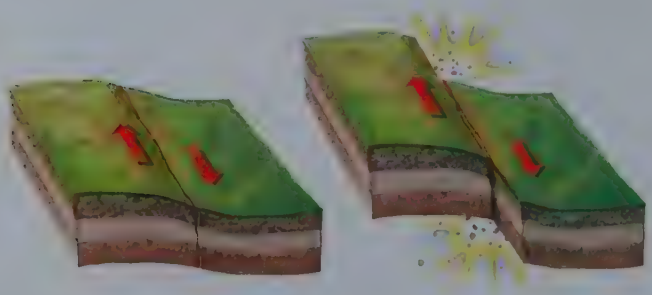
This herbaceous plant, which can grow up to 1 metre high, has pink flowers and crimson sepals. It grows almost anywhere, and, like the broom plant in Mediterranean regions, is one of the first to grow on volcanic ground, once the lava has cooled.

DEEP UNDERGROUND

The ground underneath our feet rests on enormous plates of rock, up to 100km thick, which fit together like the pieces of a jigsaw puzzle. These tectonic plates float on the magma of Earth's mantle which covers all the Earth. Their movement, which is very slow and continuous, can make continents collide or increase the depth of the oceans. When these plates move or push against each other in a violent way in the depths of the Earth, the force of the collision causes powerful waves, known as seismic waves. These seismic waves start from the hypocentre and reach the Earth's surface at a point called the epicentre. Here the Earth trembles with the force of strong shocks – this is an earthquake.



Earthquakes happen most of all in zones which are termed 'unstable' (or seismic) – that is, where the Earth's crust is particularly mobile, such as along the edge of the plates of continents. Many volcanoes have also originated here through the cracks of rocks.



The Origins of an Earthquake

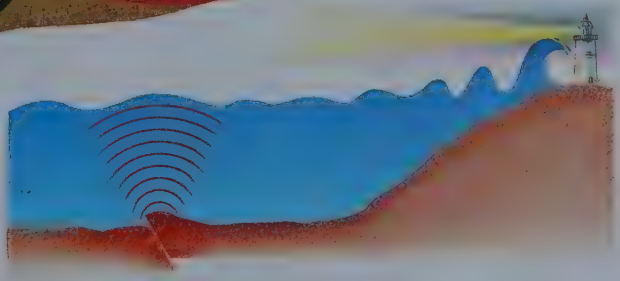
The force which pushes the continents crushes and deforms rocks. If this force is very intense, the rocks suddenly move and 'break' or 'split'. This release of energy is shown in the form of small or large earthquakes.

Seismograph

A seismograph can measure even the smallest tremor of the Earth's crust. These tremors are transmitted along the supp bar, but the spring pulls tightly to stop the needle moving. T drum moves on the support and so the trace of the earthqua is recorded on the paper on the rotating drum.

Seismic Waves

These are a result of the energy released from the hypocentre. They come in many different forms and can go in all directions. The slowest seismic waves move like the oscillations of a whip. When they reach the Earth's surface, they form concentric circles which spread from the epicentre.



Seaquake

This is a sudden movement of the rocks on the seabed which is transmitted through the water. The energy of this movement causes very violent and enormously high waves up to 20 or 30 metres which crash against the coast destroying everything. Seaquakes occur frequently in Japan, where the enormous sea waves they cause are called tsunami.

THE EARTH SHAKES

The most devastating and striking effects of earthquakes are caused by the seismic waves which rise up to the Earth's surface. Here, they spread out from the epicentre in concentric circles, like a stone thrown into a pool of water. These surface waves make rocks oscillate (sway) back and forth and from side to side. These oscillations are very slow, but their combined movements create a destructive force which is only exhausted after they have travelled great distances.

Buildings at risk

The movements of the seismic waves can make any building sway or shake. The force of oscillation at the top of a skyscraper is at least five times greater than at the base: the top storeys are destroyed (1). If a very high building is struck at a lower level, the break occurs at the point of contact (2). Anti-seismic buildings can shake without being damaged.

Intensity of an Earthquake

This is indicated by its destructive effects. Two earthquakes of the same force can cause damage which is very different, depending on the type of ground and the force with which they strike. Earthquakes are measured on a scale divided into twelve grades, depending on the amount of damage they cause.

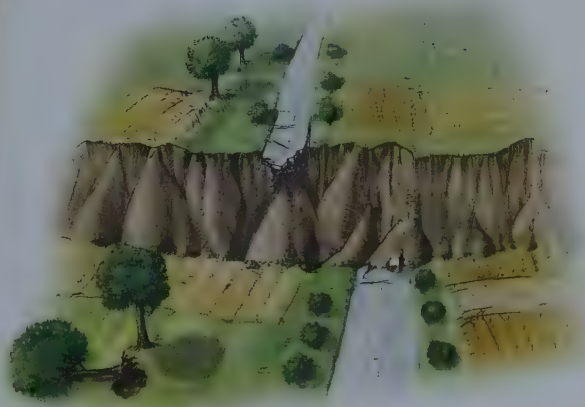
fracture

Medium tremor (Grade IV)

Lampshades shake.

Very strong tremor (Grade VI)

Furniture rocks and objects fall to the ground.

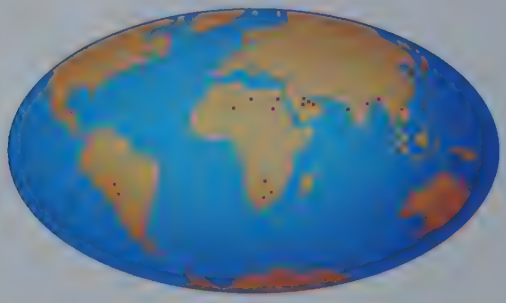


Catastrophic Tremor (Grade XI)

Chasms open up in the ground.

HIGH IN THE SKY

Natural atmospheric phenomena which arise from particular conditions of humidity and the temperature of the air can cause serious disasters, as serious as those which originate from the depths of the Earth. The most common is the storm, a phenomenon of great intensity, but of short duration. Small masses of hot, damp air rise up rapidly and meet the colder air. Here, because of the lower temperature, the air condenses into little drops of water which form thick, vertical clouds, the cumulonimbus. These accumulate water, ice and electricity which is then discharged within a few minutes with strong winds, heavy rain, hail, thunder and lightning.



Storms can strike anywhere and at any time of the year, although they are most common in spring and summer and in tropical and sub-tropical zones, where the high temperatures make the air rise rapidly.

Cumulonimbus

This huge cloud rises to over 10,000 metres. Here, blocked by a hotter layer of the atmosphere, the cloud expands sideways and takes on the shape of an anvil. Its temperature is always below zero. The highest part of the cloud is made up of crystals of ice.

Lightning

This flash of light is due to a discharge of electricity in the a between two zones of different electrical charges – such as between the ground and the Earth. The air all around heats expands and then contracts rapidly. This generates light wa (lightning) and sound waves (thunder). Thunder is heard aft lightning flashes, because sound travels more slowly than lig

cumulonimbus

hail

graduated scale

capsule with mercury

Lightning Conductor

This has a metal point which attracts the electricity in lightning and carries it down to the ground along a wire rod, without causing any damage. It was invented by Benjamin Franklin in 1752.

Hail

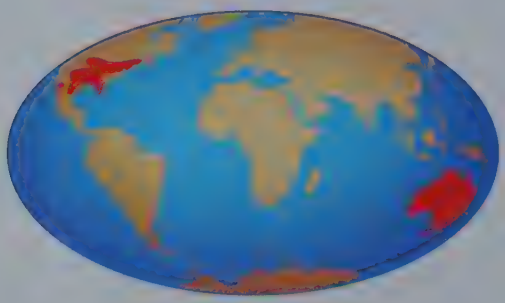
This is a fall of chips of ice which form in the highest parts of the clouds, where it is coldest. Hailstones can be as large as tennis balls, and destroy whole crops.

Barometer

This measures atmospheric pressure, that is the 'weight' of the air which presses down on the mercury contained in a small capsule and makes it rise up a thin tube. Storms are indicated by a sudden and sharp reduction in pressure.

TORNADOES AND CYCLONES

When hot air rises up in a particularly violent way, it will not only lead to a storm. The force of the rapid rise of the air creates a vortex (whirlpool) between the Earth and the base of the storm cloud, the tornado. A tornado moves rapidly, up to 500 kilometres per hour, spinning around like a long spinning-top on its way. Sometimes a tornado can last a few seconds, sometimes up to a few hours. Before it exhausts its force, a tornado will swallow up and destroy everything in its path, throwing out the debris to a distance of many kilometres.



A tornado can happen in many places and in any season of the year. Tornadoes are most frequent in the prairies of North America and in Australia.

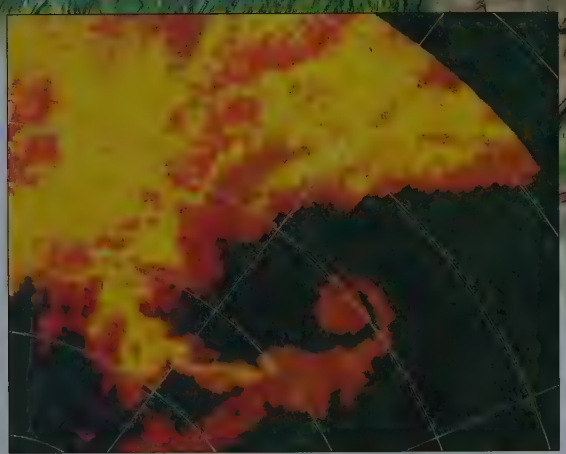
Development of a tornado

In a stormy cumulonimbus cloud, the hot air which rises up, the mesocylone, has so much violence that it 'bursts' the cloud over the top of the anvil. At its interior, a column more narrow and like a whirlpool, descends to the ground, sweeping everything away.

Waterspout

A waterspout is a small sea tornado, which forms above an expanse of water. Water is sucked up from the sea by the forc rapidly spinning funnel of air. Waterspouts are more frequent middle latitudes along the coasts. They are on a smaller scale a tornado and do not last as long.

tornado

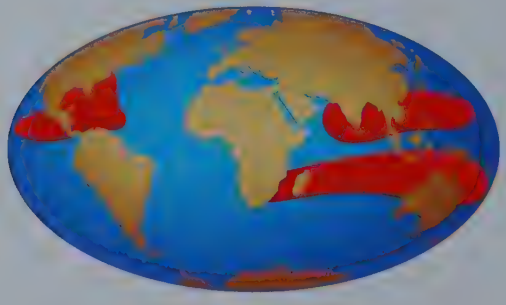


Doppler Weather Radar

This is a system using two radars which give a 3-dimensional view of the clouds characteristic of storms, cyclones and tornadoes. Doppler Weather Radar makes it possible to estimate the distance, speed and the danger of such extremes of weather. It is used particularly at airports.

HERE COMES A HURRICANE!

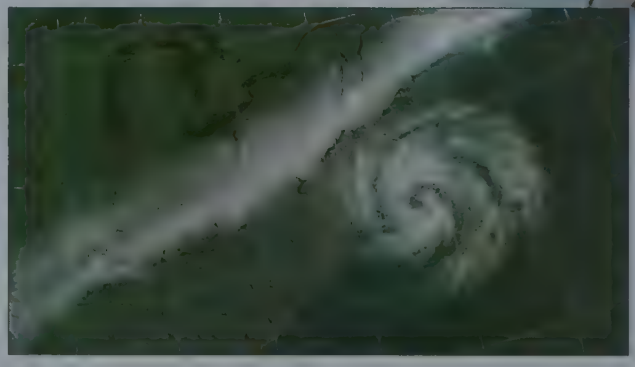
In some areas of the world, hot air, damp and light, rises up in a vast spiral called a cyclone, causing bad weather, rain and storms. In the tropical zones, above warm oceans, the air is swallowed up high by strong winds, generating tropical cyclones which are small, very violent, and are also called typhoons and hurricanes. Once cooled, the air descends and forms thick storm clouds, with rain, strong winds and electrical charges. At the centre of the spiral there is a calm zone, with clear sky – this is the 'eye' of the cyclone.



Typhoons or hurricanes begin in tropical oceans, where the temperature is at least 27°C. They are frequent from June to November in the Northern Hemisphere and from November to May in the Southern Hemisphere.

Anemometer

This measures the speed of the wind. It consists of four sticks with spoons at the end, mounted crossways on a pivot. The number of rotations per minute indicates the speed of the wind.



Satellite Images

These make it possible to follow the course of a hurricane, hour by hour. The use of satellite images helps save people's lives. They cannot help in avoiding the enormous damage to property. From the tropics, hurricanes can travel for thousands of kilometres but rather slowly. They are pushed along by gusting winds, always from east to west. They are exhausted only after several weeks.

Evolution of a Hurricane

The winds are fed by the heat transferred from the hot air as it rises and gets cooler. Along its course, the whirl of the cyclone rises up and continually spins very fast like a spinning-top. This speed of rotation equals the speed of the wind which pushes the cyclone until it reaches 300 kilometres per hour at the maximum point, a). But if, at the point at which the movement of the rotations go in the opposite direction, without the winds which are pushing (b), the speed slows down to 60 kilometres per hour.

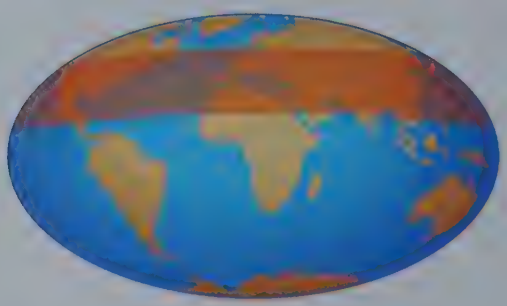
Beaufort Scale

This measures the force of the wind, according to the effects it has on the sea waves. The absence of any wind measures Grade 0: the sea is a 'mirror'; A hurricane measures Grade 12: the sea is white with the froth of the foam and high waves.

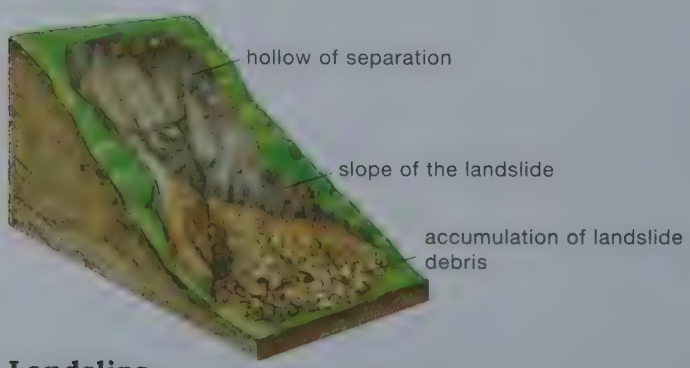
0 calm
(0 – 1 km/h)
1 puff of wind
(2 – 5 km/h)
2 light breeze
(6 – 11 km/h)
3 breeze
(12 – 19 km/h)
4 brisk breeze
(20 – 28 km/h)
5 stiff breeze
(29 – 38 km/h)
6 fresh wind
(39 – 49 km/h)
7 strong wind
(50 – 61 km/h)
8 medium storm
(62 – 74 km/h)
9 strong storm
(75 – 88 km/h)
10 tempest
(89 – 102 km/h)
11 violent tempest
(103 – 117 km/h)
12 hurricane
(over 118 km/h)

THE MOUNTAIN CRUMBLES

On sloping ground, the action of water can be particularly intense. Heavy rain dislodges rocks and carries them down to the valley, soaking into the ground and making it heavier. This breaks up the balance with the underlying layers of the ground. The ground can then give way and collapse downhill in the form of a landslide. Landslides are more frequent on the sides of mountains where nothing much grows. They also occur where people have been at work with deforestation, agriculture and over-grazing, or with the construction of roads, quarries, canals and dams.



Landslides are more common in temperate zones, where there has been heavy rain and people have been at work. These factors speed up the erosion of the soil.



Landslips

These are small-scale landslides which are caused by the breaking away of surface soil without the disturbance of the underlying rocks. It is an untidy, disordered fall of material which often happens when the side of a mountain is 'cut into' – for example, when building a road.

Collapse

This happens when bulging walls or those at the top break away in blocks of various sizes. These blocks fall to the bottom of the slope, either rolling downwards or breaking into smaller fragments. A collapse is over in a few minutes.

Subsidence

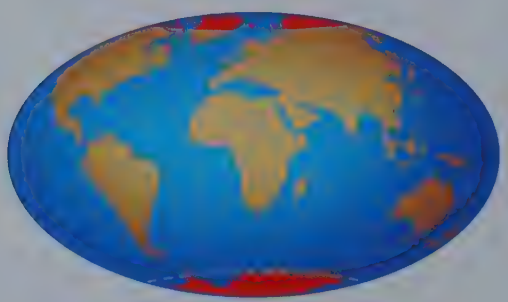
Subsidence happens when a clay soil, (soil which holds water and does not let it drain away) is soaked with rain. Then it becomes a mass of mud and slides slowly down. This movement can take months and may be noticed only when the ground appears out of shape.

Reforestation

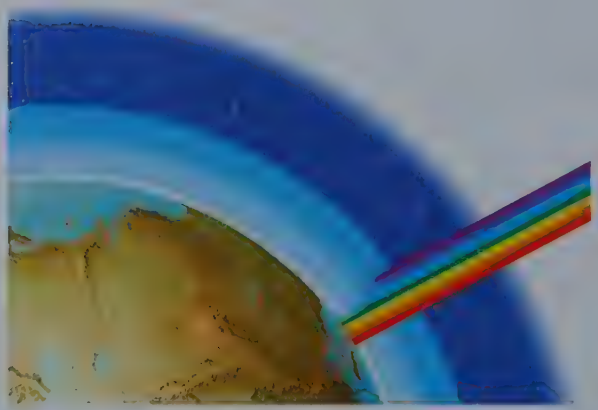
This is the most natural way of protecting the landscape. Planting rows of trees avoids the erosion of the soil, breaks landslides and slows them down. Close to the course of water, such as a river, reforestation prevents a landslide clogging up the river bed and causing dangerous flooding.

SUN STORMS

The Sun is a star made up of gases which burn at a temperature of millions of degrees. This creates heat, light and also a 'solar wind' of electrical particles which in time reach the Earth. Without the heat of the Sun, no life could survive. It also regulates the climate, and light from the Sun can reach our eyes in many different ways. When solar activity is more intense, the solar wind is very strong and forms, on contact with the atmosphere, real storms which can disturb radio communication. In polar regions, these storms create wonderful bands of coloured light called 'aurora borealis' and 'austral borealis'.



Auroras form at the high latitudes, corresponding to the Polar Circles. Every 11 years, they become more frequent because of the increased activity of the Sun.



Blue sky

This common phenomenon is due to the light from the Sun. Although light appears to be white, it is actually made up of a series of colours, or spectrum – that is, light waves of different lengths. When the Sun is high in the sky, the particles of the atmosphere spread, especially the shortest light waves – violet, indigo and blue.

Red sky

At sunset, when the Sun is 'low', the passage of light in the atmosphere is long and close to the surface of the Earth. The particles of the atmosphere spread, mainly the light waves which are the longest in the spectrum – yellow, orange and red.

Rainbow

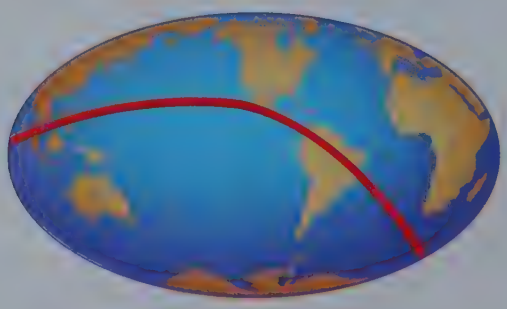
This is an arch of the seven colours of the colour spectrum which appear after rain. It is made up of drops of water which remain in the air and refract the light. A rainbow shows all the colours of the spectrum of light – red, orange, yellow, green, blue, indigo and violet.

Mirage

This misleading image is another phenomenon caused by the light of the Sun. A layer of particularly hot air, near the Earth, gives out luminous rays. These act rather like a mirror so that the Sun appears as a 'lake' on the ground.

DARKNESS BY DAY

From ancient times, people have been aware of the importance of the Sun, worshipping it as a god which rises each morning to light up the day, to warm the Earth and to give energy to all living things. But, what if the Sun disappears in broad daylight? This is called a solar eclipse, something which filled people in ancient times with terror because they did not understand the reason. Today, we know that the Moon, as it orbits the Earth, can sometimes come exactly between the Earth and the Sun. This means that its shadow is projected on to the Earth, blocking out the Sun in some areas and plunging the Earth into darkness for some minutes.



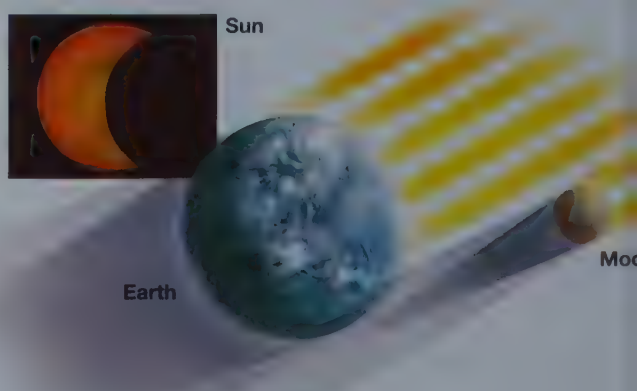
During an eclipse, the curves of shadows and half-light which the Sun projects on to the Earth follow a particular course, due to the movements of the rotation of the Earth.

Total Eclipse of the Sun

This is complete obscuring of the Sun by the Moon. It happens only when the Sun, the Moon and the Earth are perfectly lined up on the same plane and the Moon is near the Earth, so that the Moon looks as large as the Sun. It can be observed from the zone hit by the cone of the shadow: this observation enables us to study the corona of gas which surrounds the Sun.

Eclipse of the Moon

This is the obscuring or 'blocking out' of the Moon by the shadow of the Earth, when the Earth comes between the Sun and the Moon. This obscuring can be partial, but also total, when, at the phase of a full Moon, all the Moon is in the Earth's shadow.



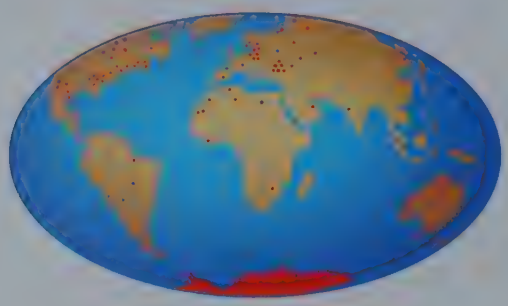
Partial Eclipse of the Sun

This happens when the alignment is not perfect and the Moon only obscures the solar disc in part. It is less spectacular than a total eclipse, but it can be observed for thousands of kilometres from the zone of the Earth hit by the cone of half-light from the Moon.

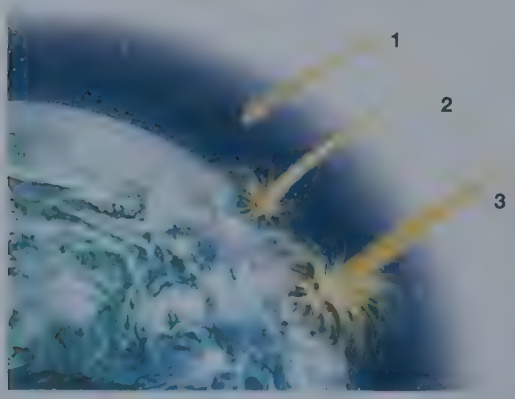

Sun
Moon
half-light
shadow
Earth

STONES FROM SPACE

In Outer Space, outside the atmosphere of the Earth, smaller fragments of rocks are in orbit around the Sun. It is believed that these date back to the time when the Solar System was formed. These rocks can be attracted by the force of gravity of the Earth and they fall rapidly towards our planet. Generally, on impact with the atmosphere, these fragments burn out and disappear, leaving luminous trails (meteors). The largest fragments, meteorites, hit the Earth's surface and are destroyed after opening up large craters in the ground and throwing enormous quantities of dust and fragments of rock up into the air. A vast cloud of dust, large enough to obscure the Sun and cool down the Earth, is thought to have been the cause of the extinction of the dinosaurs.

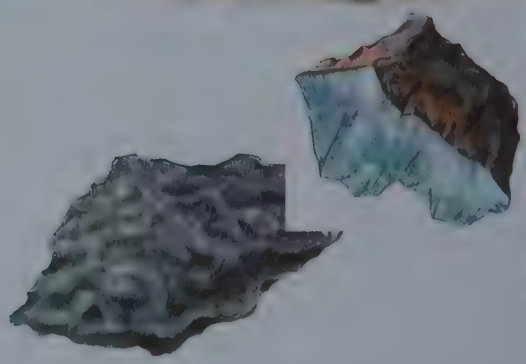


About 500 meteorites fall to Earth each year, at different points around the globe. The highest number of fragments have been found in the Antarctic, because the ice there has enclosed and conserved them.



Meteors

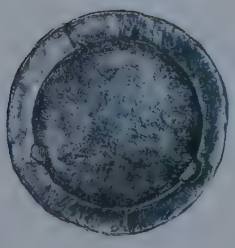
These are the rocky fragments which disintegrate in the atmosphere (1) leaving only a shining trail (a 'falling star'). If the fragments are larger and manage to hit the surface of the Earth, they are called meteorites (2) exploding on impact and throwing up dust and debris which can then fall back to Earth (3).



Meteorites

These are the fragments remaining from the original meteor, often rather small. They can be rocky (right), metallic (left) or a mixture. The study of meteorites enables us to form theories about how the Solar System was formed and its age.

meterorite



Tektites

Often as small as buttons, these are fragments which fall to Earth following the impact of a meteorite. They can be fused by the great heat of the explosion and when they solidify, they become glassy in appearance. They are found scattered for hundreds or thousands of kilometres around craters.

Lunar Craters

Almost the whole surface of the Moon is covered by lunar craters of various sizes. They are the result of a heavy shower of meterorites which happened at the time of the formation of the Solar System. The Earth, protected by the atmosphere, was hit less. Today, it is calculated that a large meteorite can fall to Earth every thousand years.

HERE ON EARTH

People study natural phenomena in an attempt to learn to control them, use them and to prevent and predict great disasters. Methods used to 'survey' the forces of nature are always becoming more sophisticated. Today, numerous satellites orbit the Earth. These photograph metre by metre, and register changes in the atmosphere minute by minute. Special weather centres process all the data gathered by satellites in space and weather stations on Earth. The large geological and atmospheric movements show that Earth is a planet which is constantly changing. The observation of so many phenomena does not prevent their natural sequence, but it can help us to live with them and to recognize and learn from the less disastrous effects as they happen.

Radar

This sends out radio signals and receives those reflected back from bodies in the atmosphere. By using more radar at the same time, it is possible to observe the formation, the movement and the speed of the great masses of clouds which are a sign of tornadoes and cyclones.

Satellite GOES (Geostationary Operational Environmental Satellite)

Launched in 1994, this is a result of co-operation between NASA (National Aeronautics and Space Administration) and NOAA (National Oceanic and Atmosphere Administration). GOES is the first of a series of weather geostationary satellites – that is, a satellite which always remains in the same point from the Earth.

Vesuvius Observatory

Built in 1848, and only 2 kilometres from the craters of Vesuvius, this is the first observatory with a site on the slopes of a volcano. As with all volcanic observatories, the seismograph and other instruments register each variation in volcanic activity.

CDC (Centre for Disease Control and Prevention)

This is a Research Centre for the control of infectious illnesses, based in Atlanta, USA. Here, samples of all common viruses and bacteria which cause illness are observed and studied – apart from the Smallpox bacteria. Thanks to a campaign of worldwide vaccination, this disease now appears to have vanished from Earth.

LANDSAT

This is a series of satellites which provide detailed images of the surface of the Earth. They are used in geology, agriculture and to monitor the areas which are particularly at risk. The first Landsat Satellite was launched in 1972.

Glossary

Atmosphere
Blanket of gases which remain around the Earth due to the force of gravity. In the lower part of the atmosphere is the air which we breathe and which forms the clouds, the rain and the winds.

Atmospheric Circulation
The continuous movements, regulated by the wind and the clouds, which form in the Earth's atmosphere and determines the climate of the world.

Atmospheric Pressure
'Weight' of air in a particular zone. High pressure indicates good weather. In zones of low pressure, the air is lighter, and so rises up and causes bad weather.

Climate
The collective term for the rain, winds, temperature and humidity which alternates during the course of a year in a region and is determined by the atmospheric weather typical of each geographic area.

Colour Spectrum
All the colours which together comprise 'white' light. Each colour is a wave of light of different length.

Cumulonimbus
Large, dark, vertical cloud which comes with storms; the highest part can contain crystals of ice and takes on the shape of an anvil.

Cyclone
Spiral of hot, damp air which rises up high, generally causing harsh weather conditions. Violent tropical cyclones can turn into hurricanes.

Earthquake
Internal movement of the Earth's crust which causes effects on the surface.

Epicentre
Point on the Earth's surface which is directly over the point underground from where an earthquake originates.

Humidity
The quantity of water or water vapour present in the Earth's atmosphere.

Landslide
Downward collapse of land caused by heavy rain dislodging rocks and soaking the ground, making it heavier, until it finally collapses. Landslides usually occur on the sides of mountains or where there has been over-grazing, deforestation (the cutting down trees), or due to the construction of roads, quarries, canals and dams.

Lava
This is magma in the form of molten rock which erupts from a volcano. Lava cools more or less rapidly on contact with the air and forms the rocks which are typical of volcanic zones. These are called effusive rocks.

Magma
A fluid mass of high temperature under the Earth's crust. It bursts out through volcanoes in the form of lava.

Rainfall
The average quantity of rain which falls in a certain period of time and in a particular zone.

Temperature
This indicates the degree of heat or cold of any given zone. It is measured using a thermometer.

Volcano
A split in the Earth's crust through which the magma from the Earth's mantle flows: the magma solidifies and forms a volcanic mountain.

Weather
Atmospheric conditions, such as wind, temperature, rain, sunshine or snow in a given zone and for one or a few days.

Wind
A thrust of more or less speed of a mass of air with respect to the Earth's surface, from one area of high pressure to one of low pressure.

EARTHQUAKES & VOLCANOES

The human race has always been fascinated by earthquakes, tornadoes and the eruption of volcanoes, despite the devastating effects they can have on our lives.

This informative book explains all such phenomena – from catastrophic hurricanes to avalanches, from the fascinating lights of the auroras to the daytime darkness of eclipses, from the effects of extreme weather conditions to the dangers which fall from the sky.

Clear, simple and accurate diagrams depict the most dramatic aspects of these great forces at work. The book also investigates the preventative measures which can be used to minimise their violent consequences.

An exciting introduction to the world of earthquakes, volcanoes and other natural phenomena.

ISBN 0-7097-
9 780709 71

Brown Watson
ENGLAND
Printed in the E.C.

VOL I